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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/064,605	07/30/2002	Ronald Scott Bunker	124626-1	6850

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GENERAL ELECTRIC COMPANY  
GLOBAL RESEARCH  
PATENT DOCKET RM. BLDG. K1-4A59  
NISKAYUNA, NY 12309

EXAMINER

ALEJANDRO, RAYMOND

ART UNIT	PAPER NUMBER
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1745

DATE MAILED: 02/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/064,605

Applicant(s)

BUNKER, RONALD SCOTT

Examiner

Raymond Alejandro

Art Unit

1745

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM  
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 07 December 2004.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4-9 and 11-19 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1,2,4-9 and 11-19 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☒ The drawing(s) filed on 02 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

Art Unit: 1745

## **DETAILED ACTION**

### ***Response to Amendment***

This submission is being provided in reply to the amendment filed on 12/07/04. The applicant has overcome the 35 USC 102 rejection. Refer to the abovementioned amendment for specific details on applicant's rebuttal arguments. However, the present claims (including newly added claim 19) are finally rejected over new art as seen below and for the reasons of record:

### ***Claim Rejections - 35 USC § 103***

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).
3. Claims 1-2, 5-9, 12-14 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Margiott 2002/0086200 in view of Pfeiffer 4781248.

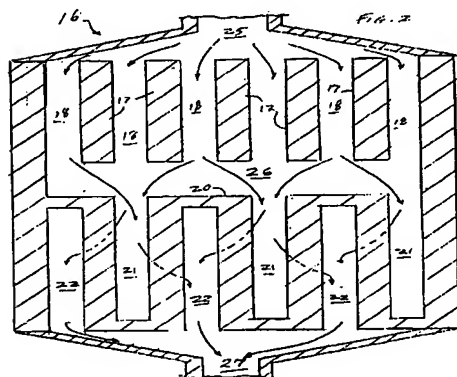
Art Unit: 1745

The present application is directed to an apparatus for fuel cell components wherein the disclosed inventive concept comprises the specific flow field plate structural arrangement. In addition, other limitations include the fuel cell components; the plurality of concavities and their shape; the flowing fluid; the upper-bottom ribs disposing angle; and the fuel cell per se and the specific fuel cell.

With respect to claims 1, 7 and 19:

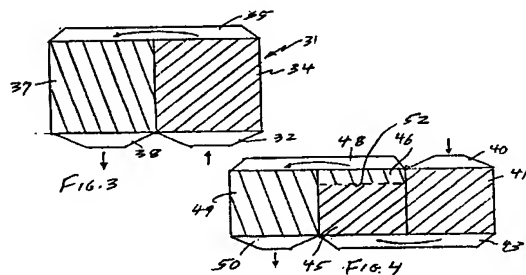
Margiott teaches a fuel cell with a reactant flow field plate comprising an inlet and an outlet; a plurality of flow-through flow field channels; a plurality of interdigitated flow field channels; and a flow transition for directing flow between said flow-through channels and said interdigitated channels, said channels and said transition extending between the inlet and the outlet (CLAIM 1).

**Figure 2** below depict the flow field plate comprising a base plate; and first and second side plate structurally connected to the ends of the base plate. The base plate includes ribs 17 defining flow-through flow field channels 18, and a serpentine rib 20 that defines inlet channels 21 and outlet channels 22 (SECTION 0013). It is also disclosed that the hybrid flow channels may be implemented in a flow field which folded one or more times (SECTION 0006). *Thus, if the channels are folded, the resulting plate structure will have channels laying one over another.*



It is also disclosed that the hybrid flow channels may be implemented in a flow field which folded one or more times (SECTION 0006). Thus, if the channels are folded, the resulting plate structure will have channels laying one over another.

**Figures 3-4** below illustrate the flow field plate in a folded configuration in which the oxidant enters through an inlet manifold 32, passes through a portion 34 of the plate having channels, then is turned by a flow reversing manifold 35 so as to flow through a portion 37 of the plate 31 which also has channels (SECTION 0014). In particular, Figure 4 shows the transition between the portions 34 and 37 not at the manifold 35 but mid-way between the manifold 35 and either of the manifolds 32 or 38 (SECTION 0014).



depending upon other parameters. In FIG. 3, a fuel cell reactant flow field plate 31 is shown in a folded configuration in which the oxidant enters through an inlet manifold 32, passes through a portion 34 of the plate 31 which has flow-through reactant flow field channels, then is turned by a flow reversing manifold 35 so as to flow through a portion 37 of the plate 31 which has interdigitated reactant flow field channels, after which the reactant flows through an exit manifold 38 to exhaust. However, the transition between the portions 34 and 37 need not occur at the manifold 35, but may be mid-way between the manifold 35 and either of the manifolds 32, 38, as is illustrated in FIG. 4. Therein, the reactant flows through an inlet manifold 40, through a first portion 41 which comprises flow-through reactant flow field channels, through a reversing manifold 43 and a second portion 45 which has flow-through reactant flow field channels, and thence through a portion 46 which has interdigitated reactant flow field channels, through a reversing manifold 48 and a portion 49 which has interdigitated flow field channels, and thence through an exit manifold 50 to exhaust. The transition 52 between the flow-through channels and the interdigitated channels may be located anywhere between the manifolds to suit any utilization of the present invention.

Art Unit: 1745

Hence, Margiott's flow field plate comprises a plurality of upper ribs and a plurality of bottom ribs forming top channels and bottom channels in the flow field plate per se to allow a flow of fluid to alternate between the top channels and the bottom channels.

With respect to claims 2 and 9:

Margiott teaches the fuel cell components anode, the cathode and the electrolyte (SECTION 0002).

With respect to claims 3-4 and 10-12 (see also specific rejection for claims 4 and 11 below):

Margiott also discloses a plurality of ribs 17 that project from the flow field plate and form recesses or indentations on the plate surface (SECTION 0013/ FIGURE 2). *Therefore, the ribs themselves also act as the claimed concavities.*

With respect to claims 5 and 13:

Margiott additionally teaches the reactants being hydrogen or a hydrogen-rich fuel and an oxygen or air oxidant (SECTION 0002).

With respect to claims 6 and 14:

*Figures 3-4 above illustrate flow fluid plates in folded configurations wherein the flow reversing manifold or the transition between the plate portions and the flow-through flow field channels and the interdigitated flow field channels are disposed at the angle of substantially 90 degrees to provide the turns or reversing manifolds.*

As to claim 8:

Margiott teaches alkaline, acid or solid polymer electrolyte fuel cells (SECTION 0002).

Art Unit: 1745

Margiott discloses a cooling apparatus for a fuel cell according to the foregoing aspects. However, Margiott does not expressly disclose the specific bottom/upper ribs providing channels having different directions.

Pfeiffer discloses a heat exchanger comprising substantially rectangular plates in alignment with one another and provided by embossing with a head-like profile of uniform total depth (COL 1, lines 9-12). It is disclosed that the plates are alternately rotated by 180 relative to one another, and are fastened detachably into a stack with the facing profiles of adjacent plates resting on one another (COL 1, lines 12-16). It is further disclosed that the plates include portions in which are formed first and second flow spaces, or a first medium flowing in one direction and a second medium flowing in the opposite direction, respectively; the first and the second flow portions being disposed diagonally opposite one another (COL 1, lines 16-20); the flow spaces are supplied with the respective medium (COL 1, lines 21-25). It is further disclosed that the plates also have a heat exchange zone and two more heat exchanger zones adjoining the middle zone on opposite sides, and one of the zone carry the flow across section of the middle zone (COL 1, lines 27-31). It is further disclosed that, for this purpose, the profile of the triangular zones comprises substantially divergent ray-like passages originating at the respective opening and merging into a chevron-like array of flow passages having a common pitch defining a mutual spacing (COL 1, lines 31-35).

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made use the specific bottom/upper ribs providing channels having different directions of Pfeiffer in the cooling apparatus of Margiott because Pfeiffer discloses that it is the principal object of the his invention to modify the heat exchanger of the above type in such a

Art Unit: 1745

way that the pressure loss dictated by the triangular zones is reduced and a substantially better media distribution over the triangular zones is attained, so that to the greatest possible extent these zones are also included in the surface area participating in the heat exchange. Accordingly, such specific bottom/upper ribs providing channels having different directions improves the fluid media distribution over zones participating in heat exchange. Therefore, heat exchanging is thus increased and enhanced.

4. Claims 4, 11 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Margiott 2002/0086200 in view Pfeiffer 4781248, and further in view of Wu et al 2002/0026999.

Margiott and Pfeiffer are applied, argued and incorporated herein for the reasons above. However, Margiott does not expressly disclose the specific concavities and their shape.

With respect to claims 4, 11 and 15-18:

Wu et al discloses a heat exchanger plate (TITLE) comprising a plurality of spaced-apart dimples 162 and 164 formed in the plate planar central portion 70. The dimples 162, 164 are located to be in registration in juxtaposed first and second plates, and are thus joined together to strengthen the plate pairs; the dimples also function to create flow augmentation between the plates (SECTION 0050/ FIGURES 15-16). Figures 15-16 illustrate the concavities having a substantial spherical shape (circular shape and depth). *The hydrodynamic interactions and heat transfer characteristic are inherent to the specific concavity structural shape.*

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific plurality of concavities of Wu et al in the cooling device of both Margiott and Pfeiffer because Wu et al disclose that the specified dimples are joined



Art Unit: 1745

together to strengthen the plate pairs; and to create flow augmentation between the plates. *Thus, the flow augmentation per se enhance the heat transfer properties of the plate. It is also noted that the two references are pertinent to each other as they both address the same problem of providing suitable heat transfer plates for fluid flow purposes.*

Moreover, with respect to the specific concavity shape or structural embodiment, it is noted changes in shape is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed concavities is significant. In re Dailey, 149 USPQ 47. It is also noted that aesthetic design changes having no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art. In re Seid , 73 USPQ 431. (See MPEP 2144.04 [R-1] **Legal Precedent as Source of Supporting Rationale**)

5. Claims 4, 11 and 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Margiott 2002/0086200 in view Pfeiffer 4781248, and further in view of Thonon et al 5806584.

Margiott and Pfeiffer are applied, argued and incorporated herein for the reasons above. However, Margiott does not expressly disclose the specific concavities and their shape.

With respect to claims 4, 11 and 15-18:

Thonon et al disclose a heat exchanger plate (TITLE) provided with hollows 14 in order to reduce pressure drops (ABSTRACT/ COL 2, lines 61-67) wherein the hollows 14 are concave reliefs in the channel (COL 3, lines 1-5). Thonon et al disclose that the specified hollows provided on the plate assist in reducing pressure drops and disturb the flow of fluids to increase heat transfers through the plates (Abstract/ COL 1, lines 5-12). As evident from Figure 3, the

Art Unit: 1745

hollow 14 has a semicircular shape and a depth, thus, it can be considered to have a hemispherical shape. *The hydrodynamic interactions and heat transfer characteristic are inherent to the specific hollow (concavity) structural shape.*

In view of the above, it would have been obvious to one skilled in the art at the time the invention was made to use the specific plurality of concavities of Thonon et al in the cooling device of Margiott and Pfeiffer because Thonon et al disclose that the specified hollows provided on the plate assist in reducing pressure drops and disturb the flow of fluids to increase heat transfers through the plates. *Hence, the disturbance of fluid flow itself enhances the heat transfer properties of the plate. It is also noted that the two references are pertinent to each other as they both address the same problem of providing suitable heat transfer plates for fluid flow purposes.*

Moreover, with respect to the specific concavity shape or structural embodiment, it is noted changes in shape is a matter of choice which a person of ordinary skill in the art would have found obvious absent persuasive evidence that the particular configuration of the claimed concavities is significant. In re Dailey, 149 USPQ 47. It is also noted that aesthetic design changes having no mechanical function cannot be relied upon to patentably distinguish the claimed invention from the prior art. In re Seid , 73 USPQ 431. (See MPEP 2144.04 [R-1] Legal Precedent as Source of Supporting Rationale)

### ***Response to Arguments***

6. Applicant's arguments with respect to claims 1-2, 4-9 and 11-19 have been considered but are moot in view of the new ground(s) of rejection.

Art Unit: 1745

*Conclusion*

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Raymond Alejandro whose telephone number is (571) 272-1282. The examiner can normally be reached on Monday-Thursday (8:00 am - 6:30 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick J. Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Art Unit: 1745

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Raymond Alejandro  
Examiner  
Art Unit 1745

A handwritten signature in black ink, appearing to read 'RAJ', with a long, sweeping horizontal line extending to the right.